

In the Claims

1. (currently amended) A gradient copolymer comprising at least two monomers,
  - a) the first ( $M_1$ ), the homopolymer of which corresponding to a  $Tg_1$  of less than  $20^{\circ}\text{C}$ , representing at least 50% by weight of the total weight of the copolymer,
  - b) the second ( $M_2$ ), the homopolymer of which corresponding to a  $Tg_2$  of greater than  $20^{\circ}\text{C}$  and preferably of greater than  $50^{\circ}\text{C}$ , representing at most 50% by weight of the total weight of the copolymer,at least one of the monomers ~~having to be~~ being hydrophilic and ~~represent~~ representing at least 5% by weight of the total weight of the copolymer,  
said copolymer comprising characterized in that it comprises at least one monomer  $M_i$  such that the probability of encountering  $M_i$  in any standardized position  $x$  situated on the polymer chain is nonzero.
2. (currently amended) The copolymer as claimed in claim 1, ~~characterized in that~~ wherein  $Tg_1$  is between  $-150$  and  $20^{\circ}\text{C}$ . and preferably between  $-120$  and  $15^{\circ}\text{C}$ .
3. (currently amended) The copolymer as claimed in ~~claim 1 or 2~~ claim 1, characterized ~~in that it exhibits~~ having an average masses of between  $5000$  g/mol and  $1\ 000\ 000$  g/mol and ~~exhibits~~ exhibiting a polydispersity ~~indices~~ index of between  $1.1$  and  $2.5$ , preferably between  $1.1$  and  $2$ .
4. (currently amended) The copolymer as claimed ~~in one of the preceding claims in~~ claim 1, ~~characterized in that~~ wherein the hydrophilic monomer represents at least 10% by weight of the total weight of the copolymer.
5. (currently amended) The copolymer as claimed ~~in one of the preceding claims in~~ claim 1, ~~characterized in that~~ wherein the hydrophilic monomer is ~~chosen~~ selected from the group consisting of:
  - ethylenic carboxylic acids, ~~such as~~ acrylic acid, methacrylic acid, itaconic acid or fumaric acid;
  - acrylates and methacrylates of polyethylene glycol or of glycol which are or

are not substituted on their end functional group by alkyl, phosphate, phosphonate or sulfonate groups;

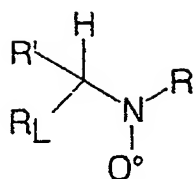
- amides of unsaturated carboxylic acids, ~~such as~~ acrylamide, ~~or~~ methacrylamide and their N-substituted derivatives;
- aminoalkyl acrylates, ~~and~~ methacrylates, ~~and~~ aminoalkylmethacrylamides;
- carboxylic anhydrides carrying a vinyl bond, ~~such as~~ maleic anhydride, ~~or~~ fumaric anhydride;
- vinylamides, ~~such as~~ vinylpyrrolidone, ~~or~~ vinylacetamide;
- vinylamines, such as vinylmorpholine, ~~or~~ vinylamine; and
- vinylpyridine.

6. (currently amended) The copolymer as claimed in ~~one of claims 1 to 5~~ claim 1, characterized in that wherein the monomer M<sub>1</sub> is ~~chosen from the following~~ selected from the group of monomers consisting of:

- linear or branched C<sub>1</sub>-C<sub>12</sub> alkyl acrylates,
- polyethylene glycol acrylate ~~or~~ polyethylene glycol (meth)acrylate,
- dienes, ~~such as~~ butadiene ~~or~~ and isoprene.

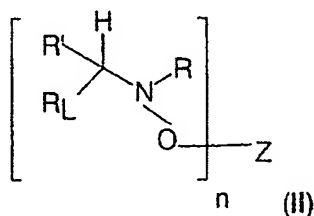
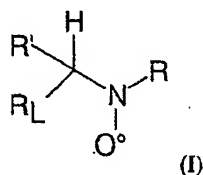
7. (currently amended) A process for producing a gradient copolymer comprising polymerizing by the solution or bulk controlled radical polymerization, at a temperature of between 10 and 160°C ~~and preferably between 25 and 130°C~~, in the presence of a radical polymerization initiator and of an agent for controlling the polymerization, ~~of a mixture of monomers comprising at least two monomers, the first (M<sub>1</sub>), the homopolymer of which corresponding to a Tg<sub>1</sub> of less than 20°C, preferably of between -150 and 20°C and more preferably still of between -120 and 15°C, representing at least 50% by weight of the total weight of the mixture, the second (M<sub>2</sub>), the homopolymer of which corresponding to a Tg<sub>2</sub> of greater than 20°C and preferably of greater than 50°C, representing at most 50% by weight of the total weight of the mixture, at least one of the monomers having to be hydrophilic and represent at least 5% by weight of the total weight of the mixture.~~

8. (currently amended) The process as claimed in claim 7, ~~characterized in that~~ wherein the agent for controlling the polymerization is a nitroxide of general formula:



- where R' and R, which are identical or different and which are optionally connected so as to form a ring, are alkyl groups having between 1 and 40 carbon atoms which are optionally substituted by hydroxyl, alkoxy or amino groups; preferably, R and R' are tert-butyl groups;
- and where R<sub>L</sub> is a monovalent group with a molar mass of greater than 16 g/mol which can be a phosphorus group or an aromatic group.

9. (currently amended) The process as claimed in claim 7, ~~characterized in that~~ wherein the polymerization initiator and the control agent are advantageously replaced by a mixture composed of alkoxyamine corresponding to the following general formula (II) and of nitroxide corresponding to the general formula (I):



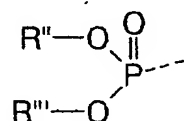
in which:

- n is an integer of less than or equal to 8 and preferably of between 1 and 3,
- Z is a carrying monovalent or polyvalent radical of styryl, acryloyl or methacryloyl type,
- where R' and R, which are identical or different and which are optionally

connected so as to form a ring, are alkyl groups having between 1 and 40 carbon atoms which are optionally substituted by hydroxyl, alkoxy or amino groups; preferably, R and R' are tert-butyl groups;

- and where R<sub>L</sub> is a monovalent group with a molar mass of greater than 16 g/mol which can be a phosphorus group or an aromatic group, the nitroxide (I) representing from 0 to 20% by weight of the total weight of the mixture.

10. (currently amended) The process as claimed in claim 8 or 9, ~~characterized in that wherein, in particular, R<sub>L</sub> is a phosphorus group and more particularly a phosphonate group of formula:~~



- where R'' and R''', which are identical or different and which are optionally connected so as to form a ring, are alkyl groups having between 1 and 40 carbon atoms which are optionally substituted by hydroxyl, alkoxy or amino groups; in particular, R'' and R''' are ethyl groups; the nitroxide (I) representing from 0 to 20% by weight of the total weight of the mixture.

11. (currently amended) A process for the aqueous dissolution, of the gradient copolymer of claim 1 comprising: ~~according to the following stages, of the gradient copolymers of claims 1 to 6 or capable of being obtained according to the process of claims 7 to 10:~~

- 1) dissolving the copolymer ~~is dissolved~~ in a ketone solution, ~~such as acetone or methyl ethyl ketone (MEK),~~ at a level of solid of between 20 and 90%, ~~preferably between 20 and 50%,~~
- 2) neutralizing the solution obtained in 1 ~~is neutralized,~~ if necessary, by addition of a molar solution either of acid or of base, the acid or base choice being conditioned by the chemical nature of the hydrophilic monomer,

3) adding water is then added, with vigorous stirring, to the solution obtained in 1 or optionally in 2 in a proportion such that the level of solid obtained is between 1 and 80%; optionally, the water can be replaced by water/alcohol mixtures in proportions ranging from 99/1 to 50/50;

4) evaporating the ketone is evaporated until the desired level of solid is obtained.

12. (canceled)

13. (currently amended) ~~The use of the gradient copolymer of claims 1 to 6 or capable of being obtained according to the process of claims 7 to 10 in formulations for claim 1 comprising a paint, adhesive, glue or cosmetic formulation. paints, adhesives or glues and in cosmetic formulations.~~

14. (canceled)

15. (canceled)

16. (canceled)

17. (new) The copolymer of claim 1 wherein the second monomer ( $M_2$ ), the homopolymer of which corresponding to a  $T_{g2}$  of greater than 50°C

18. (new) The copolymer as claimed in claim 2, wherein  $T_{g1}$  is between -120 and 15°C.

19. (new) The copolymer as claimed in claim 3, exhibiting a polydispersity index of between 1.1 and 2.

20. (new) The process of claim 7 wherein said controlled radical polymerization, occurs at a temperature of between 25 and 130°C.